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Soybean aphid efficacy screening program, 2011

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Abstract
Soybean aphid, Aphis glycines Matsumura (Hemiptera: Aphididae), has drastically changed soybean pest management in the North Central region. To date, SBA can be successfully managed by timely scouting and foliar insecticides. Host plant resistance is the newest soybean aphid management tool, and is complementary to existing chemical control. In 2011, we established plots at two Iowa State University Research Farms (Northeast and Northwest) on 17 May and 18 May, respectively. A Syngenta soybean variety (05RM310021) was used for all the soybean aphid-susceptible treatments, and a Syngenta soybean variety (07JR801843) was used for the Rag1-containing treatments. Plots were arranged in a RDCB with four replications. Soybean was planted in 30-inch rows using no-till production practices. Each plot was six rows wide and 50 ft long. Treatments containing a CruiserMaxx seed treatment were applied by Syngenta. For both locations, foliar treatments were applied using a backpack sprayer and TeeJet (Springfield, IL) twinjet nozzles (TJ 11002) with 20 gpa at 40 psi.. Foliar treatments with an R3 targeted application and were made on 26 Jul. Foliar insecticides were applied to the zero aphid plots on 26 Jul and 16 Aug. All other foliar applications were made on 16 Aug when plants were in the R5 growth stage. Soybean aphids were counted on randomly selected whole plants within each plot. To estimate the total exposure of soybean plants to soybean aphid, we calculated cumulative aphid days (CAD) based on the number of aphids per plant counted on each sampling date. Yields (bushels/acre) were determined by weighing grain with a grain hopper and corrected to 13% moisture. ANOVA was used to determine treatment effects within each experiment. Means separation for all studies was achieved using LSD with an Student-Newman-Keuls (SNK) pairwise comparison ($\alpha = 0.10$). All statistical analyses were performed using SAS® software (SAS 2011).

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SOYBEAN: *Glycine max* L.

SOYBEAN APHID EFFICACY SCREENING PROGRAM, 2011

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Soybean aphid (SBA): *Aphis glycines* Matsumura

Soybean aphid, *Aphis glycines* Matsumura (Hemiptera: Aphididae), has drastically changed soybean pest management in the North Central region. To date, SBA can be successfully managed by timely scouting and foliar insecticides. Host plant resistance is the newest soybean aphid management tool, and is complementary to existing chemical control. In 2011, we established plots at two Iowa State University Research Farms (Northeast and Northwest) on 17 May and 18 May, respectively. A Syngenta soybean variety (05RM310021) was used for all the soybean aphid-susceptible treatments, and a Syngenta soybean variety (07JR801843) was used for the *Rag1*-containing treatments. Plots were arranged in a RDCB with four replications. Soybean was planted in 30-inch rows using no-till production practices. Each plot was six rows wide and 50 ft long. Treatments containing a CruiserMaxx seed treatment were applied by Syngenta. For both locations, foliar treatments were applied using a backpack sprayer and TeeJet (Springfield, IL) twinjet nozzles (TJ 11002) with 20 gpa at 40 psi.. Foliar treatments with an R3 targeted application and were made on 26 Jul. Foliar insecticides were applied to the zero aphid plots on 26 Jul and 16 Aug. All other foliar applications were made on 16 Aug when plants were in the R5 growth stage. Soybean aphids were counted on randomly selected whole plants within each plot. To estimate the total exposure of soybean plants to soybean aphid, we calculated cumulative aphid days (CAD) based on the number of aphids per plant counted on each sampling date. Yields (bushels/acre) were determined by weighing grain with a grain hopper and corrected to 13% moisture. ANOVA was used to determine treatment effects within each experiment. Means separation for all studies was achieved using LSD with an Student-Newman-Keuls (SNK) pairwise comparison ($\alpha = 0.10$). All statistical analyses were performed using SAS® software (SAS 2011).

There was moderate CAD at the Northeast Research Farm in 2011. Soybean aphid populations in the untreated control plots averaged 50 ± 4 per plant one day prior to the 16 August, and peaked on 6 September at 435 ± 52 aphids per plant. The untreated control treatment had more CAD (3,563 ± 1,053) compared to all other insecticide treatments, but was not significantly different ($P<0.0001$; $F = 7.57$; df = 23, 3) than most foliar insecticide treatments. There was some variability in yield between treatments ($P<0.0001$; $F = 6.28$; df = 23, 3), but the *Rag1*-containing treatments had some of the lowest yield responses (Table 1). There was heavy CAD at the Northwest Research Farm in 2011. Foliar insecticides were applied to the zero aphid plots on 29 July and 10 August. All other foliar applications were made 10 August when plants were in the R4 growth stage. Soybean aphid populations in the untreated control plots averaged 263 ± 85 per plant seven days prior to the 10 August application and peaked on 27 August at 870 ± 349 aphids per plant. Soybean aphid reached 11,700 ± 3,690 CAD in the untreated control treatment. As expected with high CAD, there were significant treatment differences ($P<0.0001$; $F = 7.39$; df = 14, 3). The zero aphid control had the highest yield (65.3 ± 1.3), but was not different than the *Rag1*-containing treatments ($P<0.0001$; $F = 20.70$; df = 14, 3) (Table 2).

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Table 1

Treatment	Rate[1]	CAD ± SEM[2]	CAD-LSD[3]	Yield ± SEM[4]	Yield-LSD[5]
Untreated control	--	3563.0 ± 1053.3	C	60.1 ± 1.0	BC
Rag1	--	639.23 ±416.7	B	55.8 ± 1.6	A
CruiserMaxx Beans	56 g	782.8 ± 247.5	BC	61.3 ± 2.7	CDE
CruiserMaxx Beans + *Rag1*	--	109.5 ± 46.9	A	60.2 ± 1.3	BCD
CruiserMaxx Beans + *Rag1* +	--	74.8 ± 39.3	A	56.7 ± 3.0	AB
Warrior II	1.6 fl oz				
Warrior II	1.6 fl oz	267.8 ± 30.0	B	67.2 ± 0.8	E
Lorsban Advanced	16.0 fl oz	782.1 ± 81.8	BC	63.7 ± 0.6	CDE
Warrior II	1.6 fl oz	55.9 ± 25.9	A	63.1 ± 1.0	CDE
+ Lorsban Advanced	16.0 fl oz				
Cobalt Advanced	13.0 fl oz	1649.0 ± 865.1	BC	66.1 ± 1.1	DE
Asana XL	9.6 fl oz	1256.2 ± 641.8	BC	65.2 ± 1.3	CDE
Asana XL +	8.0 fl oz	521.4 ± 80.8	B	64.6 ± 2.0	CDE
Lannate LV	8.0 fl oz				
Hero EC	5.0 fl oz	669.2 ± 107.3	BC	66.1 ± 1.3	E
Swagger[6]	10.0 fl oz	952.5 ± 193.1	BC	66.2 ± 0.8	E
Declare	1.02 fl oz	977.6 ± 318.8	BC	66.2 ± 1.2	E
Declare	1.28 fl oz	1087.2 ± 257.1	BC	64.3 ± 0.2	CDE
Declare +	1.02 fl oz	663.4 ± 137.8	BC	64.6 ± 0.9	CDE
Nufos 4E	4.0 fl oz				
Leverage 360[6]	2.8 fl oz	1807.0 ± 531.0	BC	62.8 ± 2.1	CDE
Leverage 360[7]	2.8 fl oz	1147.0 ± 346.5	BC	62.9 ± 2.0	CDE
Leverage 360 (R3)[7]	2.8 fl oz	2171.2 ± 1237.3	BC	64.3 ± 1.1	CDE
Leverage 360	2.8 fl oz	832.2 ± 185.3	BC	65.4 ± 1.3	CDE
+ Stratego Yld (R3)[7]	4.0 fl oz				
Transform[8]	0.214 fl oz	1671.1 ± 496.1	BC	66.1 ± 0.4	E
Transform[8]	0.257 fl oz	1555.4 ± 300.0	BC	66.6 ± 1.3	E
Transform[8]	0.357 fl oz	954.5 ± 133.5	BC	66.1 ± 0.4	E
BAS310I[8]	4.0 fl oz	1637.8 ± 616.0	BC	64.3 ± 0.8	CDE

[1] Foliar product rates are given as formulated product per acre, and seed treatments are given as grams active ingredient per 100kg seed.
[2] CAD ± SEM; cumulative aphid days ± standard error of the mean.
[3] CAD-LSD; least significant different mean separation test for cumulative aphid days.
[4] Yield ± SEM; yield in bushels per acre ± standard error of the mean.
[5] Yield-LSD; least significant different mean separation test for yield.
[6] A non-ionic surfactant was included as an adjuvant and formulated at a rate of 0.25qt/ac.
[7] Crop oil and ammonium sulfate were included as adjuvants and formulated at a rate of 1qt/ac and 2 lbs/ac, respectively.
[8] Product was not labeled for soybean aphid at the time of this publication.

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Table 2

Treatment	Rate[1]	CAD ± SEM[2]	CAD-LSD[3]	Yield ± SEM[4]	Yield-LSD[5]
Untreated control	--	18896.0 ± 4420.8	E	56.8 ± 0.6	A
Rag1	--	1546.0 ± 776.1	C	65.0 ± 1.5	C
CruiserMaxx Beans	56g	19738.9 ± 3785.9	E	57.1 ± 1.7	A
CruiserMaxx Beans +	--	399.8 ± 136.0	B	64.8 ± 0.7	C
Rag1	--				
CruiserMaxx Beans +	--	55.2 ± 11.5	A	64.8 ± 1.8	C
Rag1 +	--				
Warrior II	1.6 fl oz				
Warrior II	1.6 fl oz	4342.8 ± 1931.1	D	62.8 ± 0.8	BC
Warrior II	1.6 fl oz	2957.6 ± 948.9	CD	62.6 ± 1.1	BC
Warrior II	1.6 fl oz	394.5 ± 91.5	B	65.3 ± 1.3	C
+ Lorsban Advanced	16.0 fl oz				
Cobalt Advanced	13.0 fl oz	2407.1 ± 262.0	CD	62.3 ± 0.3	BC
Endigo ZC	4.5 fl oz	4424.9 ± 1391.3	D	62.5 ± 0.6	BC
Voliam Express[6]	6.5 fl oz	4111.2 ± 551.1	D	62.2 ± 0.4	BC
Agrimek SC[6]	2.0 fl oz	20253.4 ± 6930.2	E	58.7 ± 2.3	AB
Agrimek SC[6]	2.5 fl oz	18978.0 ± 7045.3	E	57.3 ± 1.0	A
Agri-flex SC [6,7]	7.0 fl oz	7399.7 ± 1732.5	DE	62.1 ± 0.8	BC
Agri-flex SC[6,7]	8.5 fl oz	4606.8 ± 1220.1	D	61.1 ± 1.4	BC

[1] Foliar product rates are given as formulated product per acre, and seed treatments are given asgrams active ingredient per 100kg seed.
[2] CAD ± SEM; cumulative aphid days ± standard error of the mean.
[3] CAD-LSD; least significant different mean separation test for cumulative aphid days.
[4] Yield ± SEM; yield in bushels per acre ± standard error of the mean. .
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